MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2215)

DOS5311 – OPERATING SYSTEMS

(DIT)

14 FEBRUARY 2023
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **4** pages (excluding cover page).
2. Answer **ALL** questions.
3. Write your answers in the answer booklet provided.

Structured Questions, 4 Questions (Total: 40 Marks)
Instruction: *Answer **ALL** the questions in the Answer Booklet provided.*

QUESTION 1 (10 Marks)

a) Briefly describe **time-sharing system.** (2 Marks)

b) Given the memory layout as shown in **Figure 1**, determine the address of base registers and limit registers for Job F and Job J. (4 Marks)

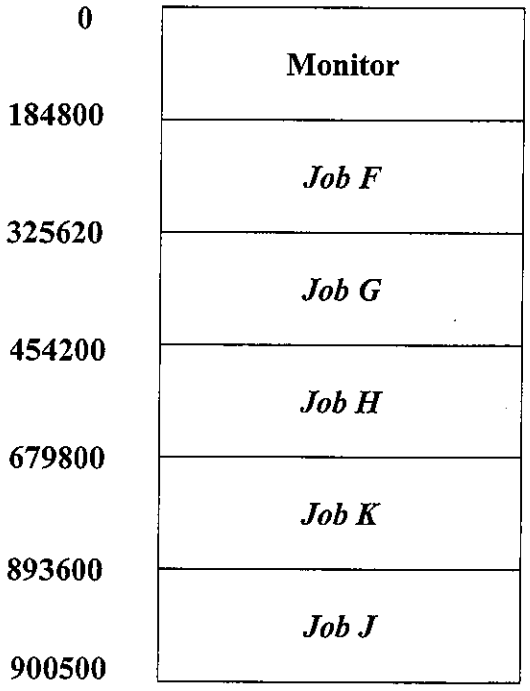


Figure 1: Memory Layout

c) Briefly explain **layered approach operating system.** State **ONE (1)** disadvantage of layered approach operating system. (2 Marks)

d) Briefly explain the **trace** of process. (2 Marks)

Continued...

QUESTION 2 (10 Marks)

Consider the following set of processes in **Table 1** with the length of the CPU-burst time given in milliseconds. The processes arrived according to the arrival time.

Process	Arrival Time *(ms)*	Burst Time *(ms)*	Priority
P_1	3	6	3
P_2	4	9	1
P_3	2	11	1
P_4	1	10	2
P_5	0	5	2

Table 1: Processes Arrival Time

a) Draw Gantt Charts illustrating the execution of these processes using the following scheduling algorithms.

i. First-Come-First-Served (1 Mark)

ii. Preemptive Priority (4.5 Marks)

b) Calculate the ***waiting time*** for each process and the ***average waiting time*** for **Preemptive Priority** scheduling algorithm. (3 Marks)

c) State and describe any **TWO (2)** operations that can be performed on a file with regards to sequential access method. (1.5 Marks)

Continued...

QUESTION 3 (10 Marks)

Consider a system with five processes P_0, P_1, P_2, and P_3 and three resource types:

Printer (18 instances), Scanner (18 instances) and Disk Drive (16 instances).

	Printer		Scanner		Disk Drive	
	Max	**Allocation**	**Max**	**Allocation**	**Max**	**Allocation**
P_0	10	6	8	3	6	2
P_1	11	5	7	5	10	4
P_2	5	3	6	4	8	6
P_3	8	1	10	4	4	1

Matrix 1: Resources Allocation

Available		
Printer	**Scanner**	**Disk Drive**
3	2	3

Matrix 2: Resources Availability

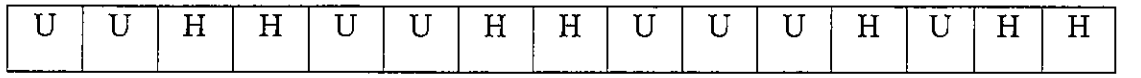
a) Based on the requirements, current allocations and available resources given in **Matrix 1** and **Matrix 2**. Determine the content of the ***Need*** matrix. (3 Marks)

b) Determine if the above system is in a safe state by providing safe sequence using safety algorithm. (7 Marks)

Continued...

QUESTION 4 (10 Marks)

a) Given a heap of memory management scheme with the following free list:



* U - Used
* H - Hole

The following process request will be received in order as listed in **Table 2**:

Process Number	Size in Kilobytes
P1	28
P2	75
P3	86
P4	47

Table 2: Process Request

Draw the memory allocation for each request above using the following memory allocation schemes:

i. First Fit (FF) (2 Marks)

ii. Worst Fit (WF) (2 Marks)

b) Consider the following page reference string as shown in **Figure 2**:

4, 5, 6, 5, 3, 4, 2, 1, 9, 4, 2, 6, 5, 6, 2

Figure 2: Page Reference String

Assuming a paging scheme with **FOUR (4)** empty frames, trace the allocation of pages to frames using the following page replacement algorithms:

i. Least Recently Used (3 Marks)

ii. Optimal (3 Marks)

End of Page.